

REMARKS:

The preceding claim amendments and the following remarks are submitted as a full and complete response to the Final Office Action issued on August 14, 2009. Claims 1 and 2 have been amended to recite the transitional phrase "consisting of" instead of "consisting essentially of." Claim 2 has been amended to recite that "the substrate is made of Si, sapphire (Al_2O_3), GaN, ScAlMgO_4 , or LiNbO_3 ." Support for the amended claim language can be found throughout the specification, for example, page 8, second full paragraph. No new matter has been added. Claims 10 and 13 have been amended to be consistent with the amended claims 1 and 2. Accordingly, claims 1, 2, 4-7, 10 and 13 are pending. Reconsideration of all outstanding rejections is respectfully requested.

Claim Rejections Under 35 U.S.C. §103

The Patent Office has maintained its rejection of claims 1, 4, 6 and 10 under 35 U.S.C. §103(a) as allegedly being obvious over Tian in view of Boyle. Claims 2, 5, 7, 10 and 13 remain rejected under 35 U.S.C. §103(a) as allegedly being obvious over Tian, in view of Boyle and Ren. The Patent Office argues that since (1) the transitional phrase "consisting essentially of" allows additional components that do not affect the claimed invention, and (2) claims 1 and 2 recite an open-ended transitional phrase "containing" in the phrase "a nutrient solution containing nutrient," the claimed nutrient solution could contain additional components such as sodium citrate or chloride ion, besides the recited nutrients. Applicants respectfully disagree.

At the outset, Applicants have amended claim 1 to recite "a nutrient solution consisting of hexamethylenetetramine, at least one selected from the group

consisting of Zn nitrate, Zn acetate, and a derivative thereof, and a solvent” and claim 2 to recite “a nutrient solution consisting of sodium citrate, at least one selected from the group consisting of Zn acetate and its derivative, and a solvent.” Therefore, neither of the nutrient solutions recited in claims 1 and 2 contains additional nutrients such as sodium citrate (in claim 1) or HMT (in claim 2). In contrast, the nutrient solution used in Tian contains both HMT and sodium citrate together with Zn nitrate. Nowhere does Tian teach or suggest a nutrient solution without sodium citrate (in claim 1) or HMT (in claim 2) for the growth of ZnO nanorod or ZnO nanowall. Boyle does not cure the deficiency of Tian because the nutrient solution used in Boyle for the growth of ZnO rods contains additional chloride ion in addition to Zn acetate and HMT. Nowhere does Boyle teach or suggest using a nutrient solution without any additional nutrients such as chloride ions. Thus, since both Tian and Boyle lack any teaching or suggestion for modifying their disclosed nutrient solution, one skilled in the art would not have been motivated from the teachings of Tian and Boyle, either alone or in combination, to use a nutrient solution as recited in claim 1.

In rejecting claim 2, the Patent Office further relies on Ren. However, Ren does not cure the deficiencies of Tian and Boyle because it fails to teach or suggest the nutrient solution as recited in claim 2 or modifying the nutrient solution disclosed in Tian or Boyle to produce the nutrient solution as recited in claim 2. Thus, even the combined teachings of Tian, Boyle and Ren would not have motivated the skilled artisan to use the nutrient solution as recited in claim 2 to grow ZnO nanoparticles to form a ZnO nanowall array with a reasonable expectation of success.

Furthermore, the Zn nanorod arrays produced by the methods disclosed in Tian and Boyle are clearly different from that of claim 1. FIGs. 2A and 2B of the

present application show that ZnO nanorod array is perfectly oriented as described at page 12, lines 11-13 of the specification. Further, X-ray data of FIG. 3 of the present application show only [00l] peaks and do not show [hk0] peaks on the ZnO nanorod array. The X-ray data of FIG. 3 demonstrate that the diameter and length of the ZnO nanorod arrays are maintained uniform as described at page 12, lines 15-20 of the specification.

However, FIG. 2 of Boyle shows that the ZnO nanorod array of Boyle has [hk0] peaks such as [100], [102] peaks. FIG 2. of Boyle evidences that the diameter and length of the ZnO nanorod arrays are not maintained uniform. Further, FIG. 1C of Boyle shows that each of the ZnO nanorods has different diameter and length and imperfect orientation. FIG. 1C of Tian shows that each of ZnO helical nanorod also has different diameter and length and imperfect orientation. Thus, it would be evident to one of ordinary skilled in the art that the Zn nanorod arrays disclosed in Tian or Boyle are totally different from that of claim 1 of present invention. That is, the methods disclosed in these references only result in Zn nanorod arrays that are different in their structures. Accordingly, one skilled in the art would not have had a reasonable expectation of success that the methods disclosed in Tian and Boyle, even if combined, would result in the Zn nanorod arrays of claim 1.

With respect to claim 2, Tian and Boyle do not disclose anything about a nanowall array and only Ren describes a nanowall array. However, the nanowall array of Ren is prepared in vacuum and high temperature condition and Ren does not teach or suggest anything about a method using a solution. Further, X-ray data of the nanowall array disclosed in FIG. 9 of the present application only show [hk0] peaks and do not show [00l] peak. However, X-ray data of nanowall array disclosed

in FIG. 17A of Ren show only [00l] peaks and do not show [hk0] peak, which clearly evidences that the nanowall array of claim 2 is completely different from that of Ren in their structures. Thus, one skilled in the art would not have had a reasonable expectation of success using the methods of Tian and/or Boyle to produce nanowall arrays as taught in Ren since the reaction condition of solution synthesis method is totally different from that of Ren. In other words, one of ordinary skill in the art would not have had a reasonable expectation that nanowall arrays can be prepared under a simple low temperature solution condition from the teachings of the prior art references, either alone or in combination.

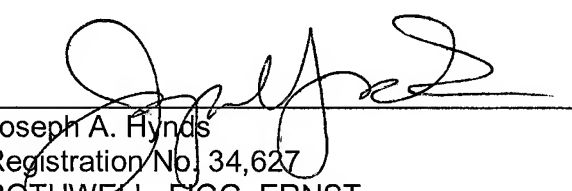
Further, Applicants also submit that the figures and test data of the present application, which are obtained from using a Si substrate, are fully representative of those for using other substrates recited in claim 1 or 2. As disclosed in page 3, lines 1-10 of the specification of the present application, Si-wafer has large lattice mismatch with ZnO in spite of its low cost; thus it is difficult to prepare a perfectly oriented ZnO nanorod array on Si-wafer substrate. However, other substrates such as Al₂O₃, GaN, etc. are smaller lattice mismatch with ZnO in comparison with Si-wafer in spite of its high price. Thus, one of ordinary skill in the art can easily expect that the test data using Si-wafer as a substrate can be a representative of data using other high price substrates since Si-wafer is most unfavorable one to prepare a ZnO nanorod array.

In view of the above, there is no *prima facie* case of obviousness established with respect to claim 1 or claim 2. Accordingly, neither claim 1 nor claim 2 would have been obvious over the prior art references, either alone or in combination. Reconsideration and withdrawal of the rejections therefore are respectfully requested.

In light of the foregoing, Applicants submit that all outstanding rejections have been overcome, and the instant application is in condition for allowance. Thus, Applicants respectfully request early allowance of the instant application. The Commissioner is hereby authorized to charge any fees or credit any overpayment to Deposit Account No. 02-2135.

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